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CONTENTS

CEMENT REFERENCE LABORATORY

The cement reference laboratory, established during the last fiscal year as a cooperative effort of Committee C-1 on Cement of the American Society for Testing Materials and the Bureau of Standards, to promote uniformity and improvement in cement testing, has been engaged for several months in field inspection of cement laboratories. The inspectors may not visit some localities for considerable periods of time, and on that account the following tolerances on apparatus should be of interest to those laboratories which desire to examine and adjust their apparatus or write purchase specifications for new apparatus. It should be understood that these tolerances are "proposed tolerances" and have not at this time any official standing as accepted standards or tentative standards of the American Society for Testing Materials. However, the cement reference laboratory is operating under these tolerances.

Proposed Revisions in A. S. T. M. Standard Specification C 9-26. Proposed Tolerances on Apparatus

1. Insert at the end of section 35 the following:

"The Vicat apparatus shall meet the following requirements:

Weight of plunger, 300 g (0.661 pounds) ± 0.5 g (±8 grains).
Diameter of larger end of plunger 1 cm (0.394 inches) ± 0.02 mm (0.001 inches).
Diameter of needle, 1 mm (0.039 inch) ± 00.1 mm (0.0005 inch).
Inside diameter of ring at bottom, 7 cm (2.75 inches) ± 3 mm (0.12 inch).
Inside diameter of ring at top, 6 cm (2.36 inches) ± 3 mm (0.12 inch).
Height of ring, 4 cm (1.57 inches) ± 0.5 mm (0.02 inch)."

2. Insert at the end of section 45 the following:

"The Gillmore needles shall meet the following requirements:

Initial needle—
Weight, ¼ pound (113.4 g) ± 8 grains (0.5 g).
Diameter, ½ inch (2.11 mm) ± 0.001 inch (0.02 mm).

Final needle—
Weight, 1 pound (453.6 g) ± 8 grains (0.5 g).
Diameter $\frac{1}{24}$ inch (1.06 mm) ± 0.001 inch (0.02 mm.)"

3. Replace subnote (3) of section 31, note 1, with the following:

"The balance used in making the fineness test shall meet the following requirements: The balance shall be inclosed in a glass case. On balances in use the tolerance to be allowed at a

load of 50 g shall be ±0.05 g, and at loads less than 0.1 g the tolerance shall be ±0.01 g. (The tolerance to be allowed on new balances shall be one-half of the value given.) The maximum sensibility reciprocal allowable at each of the loads specified above shall be twice the value of the tolerance specified for the load in question. The sensibility reciprocal is a measure of the sensitivity of a balance and is the weight required to move the position of equilibrium of the beam, pan, pointer, or other indicating device of a scale a definite amount at the capacity or at any lesser load. For a complete definition of sensibility reciprocal see Bureau of Standards Handbook M85, pp. 80–82."

After subnote (5) insert an additional subnote, as follows:

"6. The tolerances to be allowed in excess or deficiency on the weights in use in the fineness test shall be as follows:

Weight	Tolerance	Weight	Tolerance
g	g	g	g
50	0.04	0.500	0.003
20	.02	.200	.002
10	.014	.100	.001
5	.010	.050	.001
2	.006	.020	.001
1	.004	.010	.001

"The tolerances to be allowed on new weights shall be one-half the values given."

4. Add to section 33 a note to read as follows:

"The scales used in weighing materials for neat cement and mortar mixes shall meet the following requirements: On scales in use the tolerance to be allowed at a load of 1.000 g shall be ±1.0 g. (The tolerance to be allowed on new scales shall be one-half of the values given.) The sensibility reciprocal (See note 1(3) under Determination of Fineness) shall be not greater than twice the tolerance.

"The tolerances to be allowed in excess or deficiency on the weights in use in weighing materials for neat cement and mortar mixes shall be as follows:

Weight	Tolerance	Weight	Tolerance
g	g	g	g
1,000	0.5	20	0.05
500	.35	10	.04
200	.20	5	.03
100	.15	2	.02
50	.10	1	.01

"The tolerances to be allowed on new weights shall be one-half the values given."

5. Add to section 33 a note to read as follows:

"Glass graduates of 100 to 200 ml capacities used for measuring the mixing water shall be made to deliver the indicated volume at 20°C. (68°F.). The tolerance to be allowed on these graduates shall be ±1.0 ml."

6. Insert at the end of section 47 the following:

"The dimensions of the briquette molds shall meet the following requirements: Width of mold, between inside faces, at waist line of briquette, 1 inch ±0.01 inch; thickness of mold 1 inch ±0.004 inch. The tolerances to be allowed on new molds shall be one-half the values given."

7. Amend section 52 as follows:

In place of portion commencing in line 3 with "The machine shall be capable – – –" and ending in line 8 with "– – – any lesser load," insert the following:

"The error for loads of not less than 100 pounds shall not exceed ±1.0 per cent for new machines or ±1.5 per cent for used machines."

Also add to the last sentence of this same paragraph—"±25 pounds per minute."

8. Insert at the end of section 55 the following:

"The relative humidity of the moist closet shall not be less than 90 per cent."

9. Add the following note after section 28:

Note.—The balances used in the chemical analysis shall meet the following requirements: Capacity not less than 100 grams in each pan; the two arms of beam to be equal to within 1 part in 100,000; capable of reproducing results within 0.1 mg: sensibility reciprocal (see note under Determination of Fineness) not more than 0.2 mg per division of the graduated scale. The weights used in the chemical analysis shall conform to the requirements of the Bureau of Standards specifications for class "S" weights as contained in Bureau of Standards Circular 3.

PRESERVATIVE TREATMENTS FOR STONE

Although preservative treatments for stone have been used for a considerable period of time, their value has often been questioned. The type of preservative most frequently used in this country consists of a wax of stearate dissolved in a volatile solvent which is applied to the masonry with a spray or brush. This solution penetrates the pores of the masonry, and as the solvent evaporates the wax is left in the pores, forming a more or less effective seal. The preservative effect is supposed to be

gained by preventing a penetration of moisture, thus overcoming the action of frost or other harmful effects which may result from dampness inside the masonry.

It has been proved that such treatments do not entirely seal the surface pores of stone, and for this reason there has been considerable doubt concerning their value, especially where the stone is subjected to abnormal amounts of dampness. The theory is sometimes advanced that, to seal or partially seal the surface pores when water can penetrate through or behind the treatment will cause a condition under which the stone will decay from frost action at a more rapid rate than if the surface pores were left open. Since frost action on stone is the result of expansion of water in passing from the liquid to the solid state, this theory seems to be entirely sound for masonry exposed to very damp conditions where the material can become highly saturated; because the treatment would seem to hinder or prevent the extrusion of ice through the surface pores, and hence higher internal stresses would develop than if there were no surface seal.

In order to test this theory, some experiments have recently been made at this bureau on parallel series of stone specimens, one of which was treated with a 10 per cent solution of paraffin in benzol and the other left in the original state. Two sandstones and two limestones were selected for the experiments, all of which were known to have rather low resistance to frost action. After treating half the specimens of each kind with the preservative the two series were soaked in water for 14 days and absorption tests made during this time after periods of 30 minutes, 24 hours, and 14 days. While all of the treatments were indicated to be effective to the extent of greatly reducing the rate of absorption, at the end of the 14-day period the treated specimens had absorbed from 68 to 95 per cent as much as the untreated specimens. The two series were then placed in ½ inch of water in a tray and placed in the freezing chamber until frozen, after which they were taken out and thawed in water at room temperatures. This cycle was repeated until the specimens were all disintegrated.

In these experiments all of the treated specimens showed higher resistance to frost than the untreated ones. The increased resistances computed as a percentage of the number of freezings required to disintegrate the treated material were as follows: One sandstone was improved 350 per cent, another 260 per cent; one limestone was improved 190 per cent and the other 53 per cent.

These experiments indicate that such a preservative treatment is of value on the types of stone under consideration even under very severe conditions of soaking. It also seems probable that where such stones are placed in the walls of a building and exposed only to the intermittent soaking of rains or thawing snow that the treatments would be far more effective than indicated by these experiments.

SAGGER INVESTIGATION

The most recent reference to this investigation was made in Technical News Bulletin No. 142 (February, 1929), in which were reported the results of a preliminary study of a series of sagger bodies using varying combinations of clays and grogs. Among the results obtained it was found that the porosity of the fired sagger body bears a very important relation to the resistance of saggers prepared from it to failure from heat shock. In order, therefore, to determine the range in porosity most effective toward prolonging sagger life, a systematic study has been undertaken of a series of sagger bodies which have been fired at different temperatures so as to give a range in values for this property. With this work is also included a more extended study of the effect of using in a body a close burning clay as grog in comparison with grog made from an open burning clay.

A total of 38 different bodies have been prepared from clays and grogs of known properties and 300 small oval saggers and 425 specimen bars made from them. Five saggers and six speci-
from them. Five saggers and six specimen bars each of 14 different bodies were fired at three temperatures ranging from approximately 1,190° to 1,270°C. (cones 8, 10, and 12. Saggers and bars prepared from the remaining bodies were fired at either or both 1,230° and 1,270°C. The results of the test for determining the resistance of saggers to thermal shock gave the lowest temperature of failure of any one set of saggers at 350°C. and the highest temperature at 890°C. The majority of saggers had failed at or below 575° C. It would appear that those sagger bodies which had not failed at or below 600° C., a critical temperature possibly due to quartz inversion, might be expected to resist failure on being quenched from considerably higher temperatures.

Determinations are being made at present of the plastic flow of the fired bodies under load at 1,000° C. A rather unexpected result was obtained when it was found that the plastic flow of the body decreased with increased temperature of firing. The relation is not proportional, but the order of values is quite definite.

CONSTRUCTION ACTIVITY DURING AUGUST, 1929

Construction contracts awarded in 37 Eastern States during August, 1929, as reported by the F. W. Dodge Corporation, were valued at $489,132,000, a total 5 per cent less than that of August, 1928, and increasingly lower than in any of the three next preceding years. The value of industrial building contracts was 76 per cent greater and awards for commercial buildings 22 per cent greater than in August, 1928, while residential construction was 32 per cent less.

The cumulative value of awards during the first eight months of the year was $4,173,375,000, a decline of 8 per cent in comparison with $4,547,170,000 in 1928 but only about 2½ per cent lower than during 1927 and 1926. Last year's totals for the corresponding period were exceeded only in the Minneapolis and southeastern districts. Of the principal classes of construction, industrial building contracts were greater than last year by 40 per cent, commercial contracts by 5 per cent, and public works and utilities by 3 per cent, while residential construction showed a 27 per cent decline.

NUMBER OF ZONED MUNICIPALITIES

The number of zoned municipalities reported to the bureau was materially increased during September, there now being 795 cities, towns, and villages known to have zoning ordinances in effect, as compared to 754 municipalities on January 1.

COMMERCIAL STANDARD FOR BUILDERS' TEMPLATE HARDWARE

Announcements have been issued by the bureau to interested producers, distributors, and users, that the Recommended Commercial Standard for Builders' Template Hardware has received the necessary acceptances to make the project successful and that this commercial standard became effective as of September 18, 1929. It covers all the necessary dimensions and tolerances to provide complete interchangeability of template lock fronts and strikes, as well as the leading varieties of template butts, such as full mortise, half surface, full surface, and half mortise. It also includes standard template identification symbols and minimum allowances on butt hinges designed for painting. It will materially assist the hollow-metal door manufacturers and building contractors in obtaining earlier delivery, complete interchangeability, and will facilitate replacement of these items regardless of source of manufacture.

ABSOLUTE MEASUREMENT OF GAGE BLOCKS BY INTERFEROMETER

The Zeiss interference comparator has been extensively used during the month to check a number of the bureau's master precision gage blocks. Certain difficulties experienced with this instrument when received from the manufacturers have been largely overcome. The rise in temperature in the chamber containing the gage blocks resulting from conduction of heat from the helium lamp which was supported on the instrument itself was eliminated by removing the lamp a distance of 7 inches from the slit and using a small lens to focus an image of the lamp on the slit. It was planned to provide the extension tube now supporting the lamp with ventilating holes, but this has not seemed necessary as no perceptible rise in temperature has been noticed in the gage-block chamber during the time required to make a determination of the length of a gage block.

When the instrument was first used, it was noticed that there was an apparent difference in wave length from one edge to the other of the colored bands, produced by the lines in the helium spectrum. This appears to be true both with lines supposed to be single and those known to be doublets. The center of the colored bands is now being used in all cases. In most cases, where the lengths previously measured by the bureau's interferometry section have been remeasured by the Zeiss comparator in the gage section, values have been checked within 0.000002 inch and frequently within 0.000001 inch. In a few cases the bureau's masters are changing, as values obtained several months apart indicate continuous change in the same direction. These changes make the ready availability of means for absolute measurement of considerable importance.

To all absolute readings obtained with the interferometer, a correction must be applied depending on the density of the air. One source of error in determining this correction has been found to lie in the fact that in a room where the temperature frequently varies several degrees in short intervals the thermometer on a barometer does not indicate accurately the temperature of the mercury or of the barometer scale. This un-

certainty has caused errors as great as 0.0000015 in the air density correction for a 1-inch block. The bureau plans to move the barometer from the main gage section room to the constant temperature room to reduce this uncertainty. The makers of the Zeiss instrument recommend a phase change correction of 0.0000016 inch for gage blocks, but experiments have shown this correction to be too small for precision gage blocks of American make. The bureau is now using a phase change correction of 0.0000025 inch which is the value used by the interferometry section. With the Zeiss instrument, using helium, blocks up to 1 inch can be measured; the limit on length with the Pulfrich is less than this. Krypton tubes recently purchased permit measurements up to 2 inches; however, the tubes are not entirely satisfactory, as it was expected that a length of at least 6 inches could be measured.

MEETINGS OF NATIONAL SCREW THREAD COMMISSION AND AMERICAN GAGE DESIGN COMMITTEE

Meeetings of the National Screw Thread Commission and the American Gage Design Committee were held at Greenfield, Mass., on September 9 and 10. The National Screw Thread Commission met on September 9, and considered the following items:

1. Discussion of proposed revision of certain bolthead and nut dimensions.
2. Tolerances on bolt and screw stock.
3. Screw threads for gas cylinder valves.
4. Screw threads for acid drums.
5. Specifications for reversible gage blanks.
6. Washer screws for water faucets.
7. Discussion of gage classification.
8. Status of report on slotted head products.
9. Checking 3-flute and 5-flute taps and inspection of dies.
10. Specifications for material or quality of bolts.
11. Consideration of abridged reports.
12. Discussion of use of nonstandard threads by automobile manufacturers.
13. Correspondence regarding revision of S. A. E. Handbook.
14. Thread locking devices.
15. Socket-head cap and set screws.
16. Relative advantages of coarse and fine pitch threads.
17. Discussion of chart for determining helix angle of threads of various diameters and pitches.
18. Government specifications for hose coupling threads.
19. Relative value of various classes of fit.
20. Preliminary discussion of methods of gaging taper threads.
21. Appointment of delegates to World Engineering Congress, Tokyo.

Under item 1 it was voted to make certain changes in the ⅝-inch bolthead and nut dimensions to bring them into conformity with the recommendations of the Bolt, Nut, and Rivet Manufacturers' Association as approved by the sectional committee on bolt, nut, and rivet proportions.

The question of increasing the tolerance on major diameter of certain sizes and classes of screws and bolts was discussed under item 2. The evidence presented seemed to show that there is no necessity for such increase, since manufacturers are able to buy hot-rolled stock within present tolerances without extra cost, if they so specify in their orders. This applies to classes 1 and 2 in sizes where hot-rolled stock is commonly used. Under item 3, Navy specifications for gas cylinder valves were presented for discussion, and a special committee was appointed to give the matter further study. Screw-threads for acid drums (item 4) were also referred to the same committee.

After considering item 5 the commission approved the recommendations of the American Gage Design Committee covering gage blanks for reversible plug gages. Specifications for these blanks had not been completed at the time the remainder of the work of the American Gage Design Committee was approved by the commission.

Under item 6, a special committee was appointed to take up the matter of standardizing the washer screws used in water faucets. A collection of the screws now in use for this purpose was exhibited.

A discussion of the gage classification as contained in the 1928 report took place under item 7. It has been held by some that only class X gages are required by industry; the commission, however, believes that there is a need for class Y and Z gages, and took no action toward changing them from the present classification.

Under item 8, the status of the report of the sectional committee subcommittee on slotted head products was discussed. This report has not yet been finally approved by the sectional committee.

Under item 9, a brief description was given of the methods used by the Bureau of Standards in checking 3 and 5 fluted taps.

After considering item 10, the commission reaffirmed its attitude that the commission is not concerned with material, but only with dimensions of threaded products.

Under item 11, it was stated that three sections of the 1928 report are being published as separate reports for shop use. These abridged reports are as follows: (1) regular coarse and fine thread series; (2) threads of special diameters, pitches, and lengths of engagement; and, (3) design of blanks for plain and thread plug and ring gages from 0.059 inch to 4.510 inches in diameter.

The discussion under item 12 brought out the opinion that while there is still considerable use of nonstandard threads in automobile work most of this is confined to old designs and replacements, and that practically all new work is strictly in accord with the American National Screw Thread Standards.

It was agreed that the commission will take up with the Society of Automotive Engineers Screw Thread Committee at its next meeting the 12-pitch series and the extension of the fine-thread series as contained in the 1928 report. (Item 13.)

The consideration of item 14 brought forth the statement that while the commission has not gone into the question of thread-locking devices, a comprehensive investigation is now being carried out at the Bureau of Standards to determine the relative value of such devices. This investigation is being supported by manufacturers of threaded products.

Under item 15 it was reported that a subcommittee of the sectional committee on bolt, nut, and rivet proportions is working on this subject. The commission took no action.

The importance of correct helix angle in screw threads was discussed (items 16 and 17), and a chart was presented from which designers and others can readily obtain the helix angle of any thread of known diameter and pitch. The fact was mentioned that it has been found to be good engineering practice to use the so-called "fine" threads in the smaller sizes and the "coarse" threads in the larger sizes. The reason for this apparently is that the smaller sizes in the fine-thread series have practically the same helix angle as the larger sizes in the coarse-thread series. They are, therefore, of about the same "fineness." Two of the members were of the opinion that a single consistent series having a helix angle of approximately 2° or 3° would be found adequate and satisfactory for most holding purposes.

Under item 18, the secretary reported that a sectional committee is now considering the further standardization of hose threads, other than fire-hose threads and that it will be advisable for the commission to cooperate with this committee. A copy of the Federal specifications for hose threads was also presented.

Upon taking up item 19 there was an informal discussion of the question of the relative advantages of the various classes of fit, and the fact was brought out that there are very few reliable data available as to the relative strength of the various classes of fit, the effect of lead error, or as to the relative tendency of the various classes to work loose in service. It was recommended that an extensive research be carried out in this important field.

Under item 20, a preliminary discussion was presented of a proposed method of gaging taper threads. The proposed method, if put into effect, will result in a simplification of gages. It will establish definite high and low limits for the product, in place of the present method of allowing one and one-half turns either way from an ideal size which can not readily be measured.

After considering the last item, No. 21, the commission appointed Dr. George K. Burgess, Col. J. O. Johnson, and L. D. Burlingame as its official delegates to the World Engineering Congress, Tokio, Japan.

Following the meeting of the Screw Thread Commission the technical subcommittee and the editorial subcommittee of the American Gage Design Committee held a series of meetings for the purpose of reading the galley proof of the report of the committee which is being printed as Miscellaneous Publication No. 100, Bureau of Standards.

The committee will meet in January, 1930, to consider extending the work of gage standardization to other types of limit gages.

CONFERENCE ON STANDARDS FOR RECORD AND PRINTING PAPERS HELD AT BUREAU OF STANDARDS

An important step toward the adoption of standards for producer, consumer, and distributor requirements for record and printing papers was taken at the bureau on October 2. In a preliminary National conference arranged by the bureau upon the suggestion of the National Association of Purchasing Agents and the American Pulp and Paper Association, the requirements of distributors and users of fine papers were thoroughly discussed, and a committee appointed to prepare a preliminary draft of specifications for such papers. Upon the subsequent consideration and approval of these specifications at a later meeting, the requirements will be incorporated in a commercial standard for record and printing papers.

This conference may be said to have been an outgrowth of the bureau's work on the simplification of paper sizes, which originated through the appointment of a committee by Secretary Hoover in August, 1921, to investigate the number of sheet sizes of paper with a view to possible reduction. As a result, Simplified Practice Recommendation No. 22, "Paper," was issued in

1924 and became effective on July 1 of that year.

The present conference confined itself to a consideration of requirements in terms of service and utility without reference to production processes or fiber content. The standards will cover 13 different kinds of paper, including the following: Blotter, bond, book, bristols, coated board, cover paper, envelopes, ledgers, manifold, mimeograph, offset, post card stock, and safety body stock.

The distributors' and users' requirements were set forth by representatives of bankers, public utilities, insurance companies, investment houses, industrial groups, printers, paper dealers, the Educational Buyer's Association, and the National Association of Purchasing Agents.

The assistance which the Department of Commerce is prepared to render was briefly touched upon by the director of the bureau, Dr. George K. Burgess, in his opening remarks, while the assistant director for commercial standards, Ray M. Hudson, described briefly the steps which led to the adoption of the simplified practice recommendation covering paper sizes, and explained what could be done to increase still further the value of the bureau's work in the manufacture, distribution, and sale of paper. I. J. Fairchild, chief of the division of trade standards of the bureau, prepared the agenda and presided over the conference.

F. J. Schlink, representing the American Standards Association, described the association's procedure in approving one of the bureau's commercial standards as an American standard.

The conference set Tuesday, April 8, 1930, as the date for the next meeting, at which time the proposed standards of the committee will be considered for adoption as a commercial standard for every-day trade in the industry

PAPER CELLULOSE DETERMINATIONS

A number of alpha cellulose determinations have been made on various kinds of paper, to compare the method in use at the bureau with that proposed by the American Chemical Society. These indicate that the American Chemical Society method for cellulose materials can not be applied satisfactorily to paper without modification of the form of the sample and the method of filtering it. Owing to the resistance paper offers to distintegration into its component fibers, it was found necessary to grind the test specimen to a cottonlike form, as when the specimens are simply cut into small pieces as specified in the American Chemical Society method the extractions are not complete.

For filtration of the finely ground material the use of cloth in a Buchner funnel was found necessary, instead of using a Gooch crucible as described in the American Chemical Society method. Otherwise, the two methods give test results that are in good agreement. The Bureau of Standards method is the less time consuming.

Further study of the copper-number determination indicates that a modification proposed by Braidy gives increased accuracy. He replaces the Fehling solution with a solution of copper sulphate made alkaline with sodium bicarbonate and sodium carbonate, and heats for three hours in a bath having a temperature of 100° C. By means of this modification of the bureau method, the average deviation of individual results from the mean, in the case of 14 samples tested, was reduced to 1 per cent. Without the modification the deviation was 6 per cent.

STANDARD METHOD FOR THE DETERMINATION OF WEIGHTING ON SILK

The following method for the determination of weighting on silk has been worked out with the cooperation of a number of commercial laboratories. It has been approved as a standard method by the Joint Technical Committee on Silk Weighting. This committee has recommended its adoption by the Joint Committee on Weighting, which includes such organizations as The Silk Association of America, The National Retail Dry Goods Association, The Better Business Bureau, etc.

I. General.—1. By "weighting" is meant not only metallic weighting, but all materials other than fibroin present in the finished silk after it has been dried to constant weight in air at 110° C.

2. The amount of weighting is expressed in per cent of the weight of the finished silk after it has been dried, as above.

II. Sampling.—A sample taken for analysis should be representative of the material. It is recommended that a strip measuring from 2 to 4 inches wide be taken all the way across the original cloth from selvage to selvage. The sample should weigh from 1 to 5 grams.

III. Test for Silicate.—A small sample of the silk is ignited, the ash is placed in a platinum crucible and two drops of concentrated hydro-fluoric acid are added. If silicate is present, chemical action accompanied by a considerable amount of heat will be noticed.

IV. Tin Phosphate Silicate Weighted Silk.—1. The sample is dried to constant weight in an air oven at 100° C. This is called weight A.

2. The dried sample is soaked in 100 times its weight of distilled water at 65° C. for 20 minutes. It is moved about in the water every few minutes during this time in order to insure thorough penetration of water and extraction of water-soluble materials. It is then rinsed in a fresh portion of distilled water, then in alcohol, and finally in ether, after which it is dried to constant weight, as above. (Two 25 cc portions of alcohol and of ether are usually sufficient.) This is called weight B.

$$\text{Weight A} - \text{weight B} \times 100/\text{weight A} = \text{finishing materials in per cent}$$

3. The sample from which "finishing material" has been removed is soaked in 100 times its weight of 2 per cent hydrofluoric acid solution at 65° C. for 20 minutes. It is then rinsed in water and treated in 100 times its weight of 2 per cent sodium carbonate solution at 65° C. for 20 minutes. It is then rinsed in water, in alcohol, and in ether and dried to constant weight as before. This is called weight C.

4. The sample is then ashed and the ash weighed, weight D. This ash should not weight more than one-tenth of the difference between weight B and weight C. If the silk contains a considerable amount of weighting, the treatment given in (3) above should be repeated with fresh solutions before the sample is ashed in order to obtain a low ash. A few threads of the silk treated along with the sample and ashed will show the operator whether the weighting has been removed in (3) or if the treatment must be repeated.

5. $$\frac{\text{Weight A} - \text{weight C} + \text{weight D} \times 100}{\text{Weight A}} = \text{weighting in per cent.}$$

V. Tin Phosphate Weighted Silk.—1. The procedure for silk which does not contain silicate is the same as that given in Section IV above, except that the following will be substituted for paragraph 3: The sample from which finishing material has been removed is soaked in 100 times its weight of 4 per cent hydrochloric acid solution at 55°C. for 20 minutes. This is repeated with a fresh solution. The sample is then rinsed in water and soaked in 100 times its weight of 10 per cent sodium carbonate solution at 55°C. for 20 minutes. It is then rinsed in water and the hydrochloric treatment repeated. The sample is again rinsed in water, then in alcohol and in ether, and dried to constant weight, as before. This is called weight C.

VI. Logwood Black Weighted Silk and Silk Weighted with Lead, Zinc, or Aluminum Salts.—1. If silicate is present, the procedure is the same as that given in Section IV, except that the treatment with hydrofluoric acid is preceded by a treatment with 100 times the weight of the sample of 4 per cent hydrochloric acid solution at 55°C. for 20 minutes repeated once with a fresh portion of the solution.

2. If silicate is not present, the procedure is the same as that given in Section V.

TYPE TESTING OF COMMERCIAL AIRCRAFT ENGINES

All engines flown in licensed aircraft must be approved by the Department of Commerce as airworthy. Engines which have been tested by the Army or Navy and accepted for military purposes are approved automatically on request. Otherwise each new type of engine must pass a special test which is conducted at the Bureau of Standards.

This type testing of aircraft engines was begun at the bureau in March, 1928 (Technical News Bulletin No. 133, p. 61; May, 1928, and No. 141, p. 9; February, 1929). Since that time 38 type tests have been undertaken on 26 new types of engine, several having required a second test before passing. Of these 26 types tested 15 have passed and have received or soon will receive airworthiness certificates.

The rejection of engines has been of service to the public as may be judged from the following facts. If those engines which failed during 1928 had been put in service and flown at the speeds and horsepowers at which they were tested, they would have averaged one forced stop for each four hours of flight. How many fatalities would have resulted, no one can guess, but the number might have been large.

The test which these engines must pass at the Bureau of Standards calls for running 50 hours in ten 5-hour periods. One of these periods is at full throttle and full rated speed, the remainder at about 97 per cent of rated speed and 90 per cent of the rated horsepower. One engine of each type must pass this test without any serious structural failure and without more than three forced stops for any reason whatever. For each of the forced stops, if any, the engine is run an extra two hours.

The engine is then tested for horsepower at different speeds, and records

are made of its performance in all important respects, such as fuel and oil consumption, kind and fuel required, etc.

Engine tests of this kind are noisy and can not well be run in residential sections. For this reason a new testing plant has just been completed at Arlington Farms, near Hoover Field, Va. This plant comprises three separate testing units, each of which has a torque stand on which the engine is mounted and an observing room which houses the instruments and the testing staff. The observers are protected from injury in case of engine failure by heavily reinforced concrete walls. There are provided also (1) a shoproom especially equipped for takedown and inspection of engines after test and for minor servicing during test, (2) an office and record room, (3) a furnace room providing central heating for the entire unit. The whole is housed in a concrete building so constructed as to minimize fire hazard. There is also a separate concrete building for storage of gasoline and oil, designed for protection from fire and explosion hazards.

The entire plant, which will be completed in October by the mounting of the third torque stand, is a most satisfactory modern testing unit. It was designed entirely for the purpose of running type tests of aircraft engines in which the engine is required to supply its own cooling air; hence, it is not equipped with the external cooling systems required for special research problems. The latter type of equipment is available at the bureau's laboratory in Washington. On the other hand, the Arlington plant is especially designed for convenience and speed in the mounting, testing, and inspection of engines, and with three stands in operation will turn out at least one complete engine type test per week with a single staff of men. The output could be nearly doubled by the use of additional personnel should this become necessary in order to meet the demands of the rapidly growing aircraft engine industry.

NEW AND REVISED PUBLICATIONS ISSUED DURING SEPTEMBER, 1929

Journal of Research [1]

Bureau of Standards Journal of Research, Vol 3, No. 3, September, 1929. (RP Nos. 99 to 107, inclusive.) Obtainable only by subscription. (See footnote.)

Research Papers [1]

(Reprints from Journal of Research)

RP81. Note on a mercury spark gap for instantaneous photography; L. F. Curtiss. Price, 5 cents.

RP89. The first spectrum of krypton; William F. Meggers, T. L. deBruin, and C. J. Humphreys. Price, 15 cents.

RP90. A comparison of the formulas for the calculation of the inductance of coils and spirals wound with wire of large cross section; Frederick W. Grover. Price, 10 cents.

Circulars [1]

Supplement to Circular No. 25 (July 1, 1929). Standard samples issued or in preparation. Obtainable free on application direct to Bureau of Standards.

Simplified Practice Recommendations [1]

R28–29. Sheet steel. Price, 10 cents.

R100–29. Welded chain. Price, 10 cents.

Commercial Standards Monthly [1]

CSM. Vol. 6, No. 3, September, 1929. Obtainable only by subscription. (See footnote.)

Technical News Bulletin [1]

TNB150. Technical News Bulletin, October, 1929. Obtainable by subscription. (See footnote.)

OUTSIDE PUBLICATIONS [2]

Thermal expansion of tantalum (abstract). Peter Hidnert; Physical Review (Corning, N. Y.), Vol. 34, p. 544; August 1, 1929.

Safeguarding the storage of photographic, motion-picture, and X-ray films. C. R. Brown; Safety Engineering (New York, N. Y.), Vol. 58, No. 2, p. 65; August, 1929.

Tests of stability at elevated temperatures of X-ray film. C. R. Brown; Proceedings of a Board of the Chemical Warfare Service (Washington, D. C.) on the Cleveland Clinic Disaster; p. 46; May 15, 1929.

Present status of the technic of evaluating paint service. P. H. Walker; American Paint Journal (St. Louis, Mo.), Vol. 13, No. 49, p. 68; September 23, 1929, and Paint, Oil and Chemical Review (Chicago, Ill.), Vol. 88, No. 13, p. 12; September 28, 1929.

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[1] Send orders for publications under this heading with remittance only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 25 cents per year (United States and its possessions, Canada, Cuba, Mexico, Newfoundland, and Republic of Panama); other countries, 40 cents. Subscription to Bureau of Standards Journal of Research, $2.75; other countries, $3.50. Subscription to Commercial Standards Monthly, $1; other countries, $1.25.

[2] "Outside publications" are not for distribution or sale by the Government. Requests should be sent direct to publishers.

Determining gasoline yield of gas. Martin Shepherd; Oil and Gas Journal (Tulsa, Okla.), Vol. 26, No. 6, p. 48; June 27, 1929, and National Petroleum News (Cleveland, Ohio), Vol. 21, No. 26, p. 31; June 29, 1929.

Minimum temperature recording strut thermometer. H. B. Henrickson; Instruments (Pittsburgh, Pa.), Vol. 2, No. 9, p. 323; September, 1929.

Recent developments in aircraft instruments. W. G. Brombacher; Transactions, American Society of Mechanical Engineers (New York, N. Y.), Aeronautical Engineering, Vol. 1, p. 119; 1929.

The relation between the absorption spectra and chemical constitution of certain azo dyes. I. The effect of position isomerism on the absorption spectra of methyl derivatives of benzene-azophenol. W. R. Brode; Journal, American Chemical Society (Washington, D. C.), Vol. 51, p. 1204; April, 1929.

Quantitative relation between the spectral reflection of textile dyeings and the amount of dye used. W. D. Appel; Reprinted from paper presented at meeting of Textile Research Council (Boston, Mass.), May 24, 1929.

New rayon testing methods described. W. D. Appel; Daily News Record, Rayon Section (New York, N. Y.), Section 3, p. 28; September 16, 1929.

Historical sketch of the United States Bureau of Standards paper mill. B. W. Scribner; Superior Facts (Paper Makers Chemical Corp., Holyoke, Mass.), Vol. 3, No. 2, p. 7; August, 1929.

A study of fiber wall boards for developing specification standards. B. W. Scribner and F. T. Carson; Paper Trade Journal (New York, N. Y.), Vol. 89, No. 13, p. 61; September 26, 1929.

Hot aqueous solutions for the quenching of steels. H. J. French and T. E. Hamill; American Society for Steel Treating (Cleveland, Ohio), Preprint No. 8; September, 1929.

Comparative properties of wrought iron made by hand-puddling and by "Aston" process. H. S. Rawdon and O. A. Knight; Metals and Alloys (Chemical Catalog Co., New York, N. Y.), Vol. 1, No. 2, p. 46; August, 1929.

Making a glass disk for a 70-inch telescope reflector. A. N. Finn; Industrial and Engineering Chemistry (Washington, D. C.), Vol. 21, No. 8, p. 744; August, 1929.

The cause of unsoundness in Portland cement. William Lerch; Portland Cement Association Fellowship (care of Bureau of Standards, Washington, D. C.), Paper No. 20, July 1929.

Effect of wetting on compressive strength of clay brick walls. A. H. Stang; The Ceramic Age (Chicago, Ill.), Vol. 14, No. 3, p. 101; September, 1929.

Studies of machines for extruding clay columns. P. G. Grunwell; The Ceramic Age (Chicago, Ill.), Vol. 14, No. 3, p. 88; September, 1929.

Effect of water in expanding ceramic bodies of different compositions. H. G. Schurecht and G. R. Pole; Journal, American Ceramic Society (Columbus, Ohio), Vol. 12, No. 9, p. 596; September, 1929.

The strangest thing in physics. Paul R. Heyl; Scientific American (New York, N. Y.), Vol. 140, No. 6, p. 498; June, 1929.

The following articles were published in the series on "Industrial Research" in the United States Daily (Washington, D. C.):

Hugh G. Boutell:
- Refrigeration; September 13.
- Refrigerants; September 14.

Henry D. Hubbard:
- Laundry operations; September 7, 1929.
- Research on textiles; September 9, 1929.
- Standardization of textiles; September 10, 1929.
- Utilization of clay; September 11, 1929.
- Clay products; September 12, 1929.
- Studies of chemical elements; September 16, 1929.
- Rare materials; September 17, 1929.

H. H. Steidle: Grades of fuel oil; September 18, 1929.

S. F. Tillman: The Commercial Standards Monthly; September 19, 1929.

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